

From: [jeff.parker](#)
To: [Phil North](#)
Subject: FW: [bbwg] Fwd: BBC - Salmon
Date: 10/28/2010 10:33 PM
Attachments: [message-footer.txt](#)

From: carolw@alaskalife.net [mailto:carolw@alaskalife.net]
Sent: Thursday, October 28, 2010 7:05 PM
To: BBWG Group
Subject: [bbwg] Fwd: BBC - Salmon

Here are some of my planned answers to questions raised by BBC. The Nature Conservancy will have the final AWC report out within the next few weeks.
Carol Ann

From: carolw@alaskalife.net [mailto:carolw@alaskalife.net]
Sent: 20 October 2010 08:42
To: Neil McCarthy
Cc: Erin Dovichin; Tim Troll
Subject: Re: BBC - Salmon

Hello Neil,
Please see my responses below.

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On Oct 18, 2010, at 8:20 AM, Neil McCarthy wrote:

Hi Carol

these are the areas I'd like to focus on with you.

When we did the Pebble tour certain claims were made which I'd like you to respond to.

1) As we flew over the deposit with Frying Pan lake just to the south, it was said there is very little documentation about salmon in the south fork of the Koktuli stream system. They said the salmon don't usually get past the lake and the south fork has an area which dries out most years and this affects salmon migration anyway. So, is this true? And is Frying Pan lake not a designated tailings dam in any case?

Compared to most of Alaska there is much information on South Fork Koktuli, but not comprehensive. For the last 3 years, under contract to The Nature Conservancy, I led a team of federal, state, Tribal, University and NGO scientists in the first fish surveys of headwater tributaries in that region. Last year representatives from The Pebble Limited Partnership were invited to join and they did. We found rearing salmon in 3 of every 4 headwater tributaries surveyed, with the exception of one drainage. We found non-salmon fish important to subsistence users-primarily Alaska Natives, and to sport fishers in 93% of surveyed streams. We documented salmon rearing in two tributaries directly on top of the Pebble mineral deposit and in streams above Frying Pan Lake. Consultants for the Pebble Limited Partnership also reported sockeye salmon in Frying Pan Lake and also found rearing coho above the lake.

The South Fork Koktuli may sometimes go dry under very low flow conditions as do other essential salmon habitats, but they are not always dry, and salmon have adapted to exploit these habitats. For example, every year there are annual spring and fall floods. Small salmon heading to sea or seeking better feeding areas migrate downstream during

this time. In Fall, spawning salmon, especially coho, take advantage of rising waters to access spawning habitat. In fact, adult pre-spawning salmon have been documented by Alaska Dept. of Fish and Game biologists in and above the area that sometimes goes dry in the SFK (see attached map).

(One amazing find from last year was the presence of salmon in a series of spring-fed pools with no surface connection to a salmon stream. The salmon were fat and healthy, but how did they get there? Salmon may have accessed the area by swimming through groundwater, or they may have gotten there during an annual flood.)

2) The Pebble spokesman said that locating the mine at the tributaries is a benefit since you don't have water flowing through it. But isn't there ground water which will be disturbed and what benefit to the salmon in any case? **Tributaries, by definition, are composed of flowing water. The tributaries that flow from and through the mine claims in the region support salmon and feed the aquatic ecosystem upon which salmon depend. Water flows both horizontally and vertically or into and up from groundwater in that region. The extensive groundwater system there upwells into salmon supporting tributaries. Spawning salmon, especially sockeye salmon, are attracted to upwelling groundwater for spawning. Embryonic salmon will incubate over the harsh Alaska winter in groundwater which does not freeze it provides a thermally stable incubation environment for salmon embryos.**

3) They said they would put the landscape back as they found it once the mining was over. How realistic is this?

No mine of this size and type has ever been restored to pre-mining conditions.

4) How important is the area of the deposit and proposed mine/tailings to the salmon and their spawning cycle? Since water emanating from that region feed and support rearing, spawning, incubation, and migration of salmon, I submit that those habitats are essential to salmon and to maintenance of Bristol Bay salmon biodiversity...

5) **impact of copper on salmon.** Copper is one of the most toxic elements to freshwater aquatic life. Historic and recent scientific studies indicate that slight increases in copper, of just 2 parts per billion above naturally occurring levels, can impair or destroy a fishes sense of smell. Scientific studies show that salmon rely on their sense of smell to identify "home" or birth habitats, they also use smell to ID predators, prey, kin and mates.

For example, lets look at homing, a key trait. Young salmon memorize a map of chemical cues as they migrate to sea that when they return to spawn, guides them back to the streams and beaches where they were born. If a young salmon or and adult salmon returning to spawn cannot smell, then they can get lost, stray to and spawn in areas their genes are not adapted to. Or if the chemical smell of their stream changes they may not recognize their spawning stream. This has potential to reduce survival and it has huge implications for maintenance of genetic diversity.

AND Higher rates of predation have been shown on salmon exposed to low levels of copper compared to salmon not exposed to copper.

AND Studies of rainbow trout show those that feed and defend feeding territories together with their brothers and sisters have higher growth rates and that can increase their probability of surviving winter. But if they can't recognize siblings then they would have to go it alone and may not grow as well and suffer reduced winter survival.

6) **your overall concerns about the mine and the future of the wild alaskan salmon and the fishery.**

Bristol Bay Alaska and Kamchatka Russia are considered by top salmon scientists to be the world's most important sockeye salmon habitats and top priority for conservation. My work in Kamchatka suggests that salmon will not fare well there, however, Bristol Bay has the highest sockeye biodiversity in the world and the aquatic ecosystems upon which they depend are still intact. Bristol Bay is the Gene Bank for future sockeye salmon restoration.

The Pebble Prospect is currently one of over 800 mi² of contiguous mine claims in watersheds that drain to the Nushagak and to Iliamna Lake of the Kvichak. Iliamna Lake is the world's largest sockeye salmon rearing lake, within which hundreds of millions, and some years billions, of sockeye salmon fry rear one to two years prior to heading to sea. The Nushagak and the Kvichak together have produced the majority of sockeye commercially harvested from Bristol Bay over the last 126 years. These systems have supported Native Alaskans for thousands of years.

My greatest concern relative to such extensive mining in this region is that we will repeat our history with salmon across the world.

Which is: we allowed salmon habitat to be destroyed, that we allowed water to be contaminated, that we allowed promises of full restoration to go unfulfilled, that we allowed perpetual storage of toxic waste behind earthen dams, that we allowed dams to fail, that accidents do happen and that earthquake will too.

